Canadian Space Agency | Agence spatiale canadienne

Executing Successful Partnerships With NASA
An International Partner's Perspective: Lessons Learned

2010 NASA PM Challenge
Galveston, Texas

Graham Gibbs
Counsellor Space Affairs - Canadian Space Agency
Canadian Embassy
Washington
February 9, 2010

Canada

OUTLINE

- Overview Canada-United Civil Space Cooperation
- The Big Picture
- Space Science and Earth Observation
- International Space Station Lessons Learned for PMs
- Applying Lessons Learned to International Exploration
- Conclusions

ATTACHED: A more detailed version of the presentation

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Executing Successful Partnerships with NASA

Canada – United States Civil Space Cooperation

- Human Space Flight (Shuttle & ISS)
- Astronaut Corps (Cdn astronauts embedded at JSC)
- Life & Microgravity Science (Shuttle & ISS)
- Earth Science and Observation (Instruments & RADARSAT)
- Astronomy (JWST and Cdn MOST)
- Heliophysics (THEMIS & International Living With a Star)
- Exploration (Mars Phoenix & MSL et al)

- Earth Science & Observation (RADARSAT)

- Ice Monitoring & Cooperation with the Canadian Ice Service (RADARSAT)

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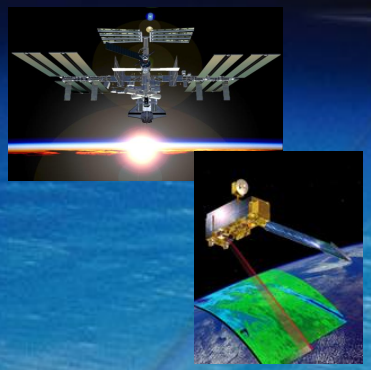
Canada

The Big Picture Lessons Learned

From the Private Sector:

The best agreements;

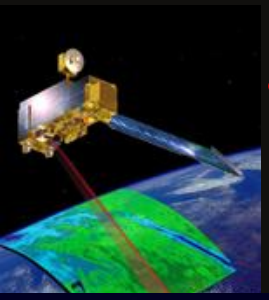
- Might be difficult to negotiate but don't have to be referred to later.
- Fair (profitable) for both/all parties.

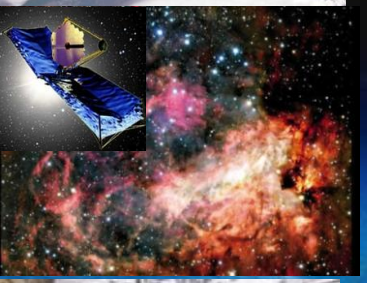


From the Public (Space) Sector:

- Be prepared for national prerogatives,
- Understand differing cultures,
- Accept the risks as well as the benefits,
- Funding; consistency & no-exchange,
- Be prepared to seek compromises.

Space Science and Earth Observation 1 of 2





Some Realities to Consider - Positive and Negative

- International collaboration among scientists,
- International Announcements of Opportunity – most often competitive,
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- Obligations subject to "availability of appropriated funds",
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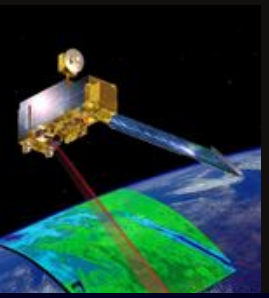
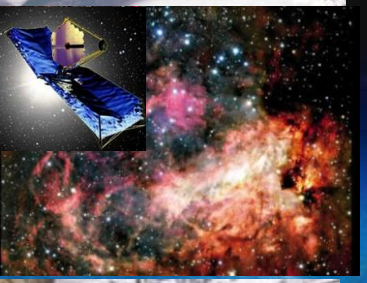
Space Science and Earth Observation 2 of 2





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- Partners responsibilities are deliverables - not financial investment,
- Agreements legally binding or political/morale commitments,
- Data sharing,
- National Security interests – technology transfer, data policies etc.

ISS Lessons Learned

Implications for Project Managers

- Managing the classical parameters (cost, schedule, performance) is no longer sufficient
- Must manage through political changes that can/will have fundamental impact on program
- Diplomatic skills are essential to the "first among equals" concept
- International cooperation takes considerable extra time & effort
- Flexibility and understanding are essential

Applying Lessons Learned to International Exploration of Space

- We will not be able to identify every contingency in advance so structure for cooperation must allow for flexibility.
- High-level political leadership may be necessary to garner international support/participation e.g. the ISS & GEO examples.
- Recognize the many similarities in partners plans/aspirations for exploration.
- Exploration beyond Earth orbit is an intrinsically global enterprise.
- International partnerships provide tangible benefits
  e.g. broadening public & political support, sharing cost & risk, enrich scientific & technical content, sustainability.

Conclusions

- Agreements should be mutually beneficial and binding
- Expect to share the risks as well as the benefits
- Expect to compromise
- Appreciate differing cultures, methods, national prerogatives
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- Be prepared to manage through political changes
- Cooperation can be hard but going alone can be harder
- Be a reliable and welcomed partner
- US ITARS – live with it !!
- NASA is a generous partner (though at times difficult!)

Thank You

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HANDOUT

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- The Global Exploration Strategy and the International Space Exploration Coordination Group
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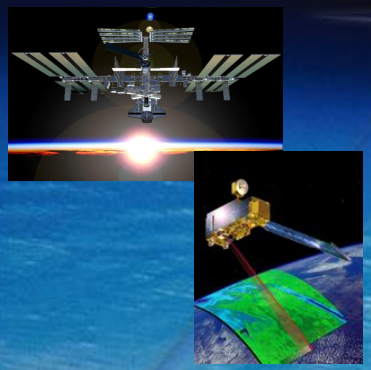

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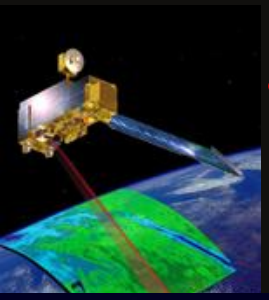

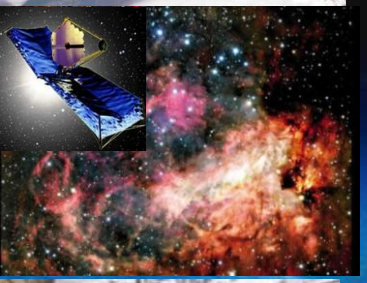

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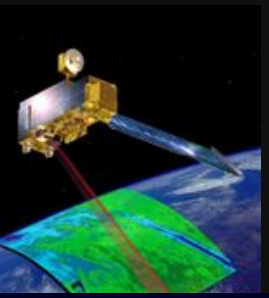

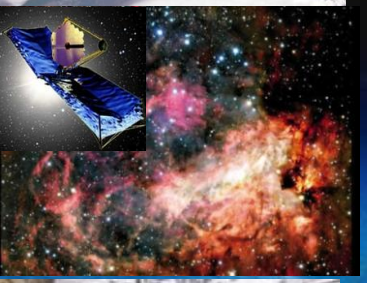

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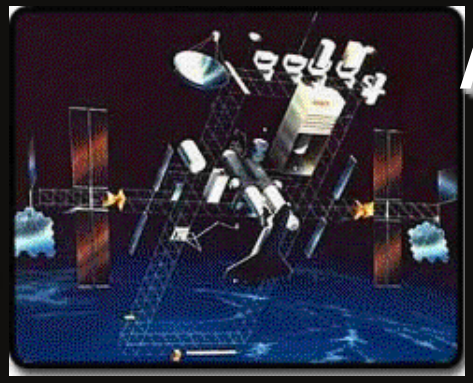
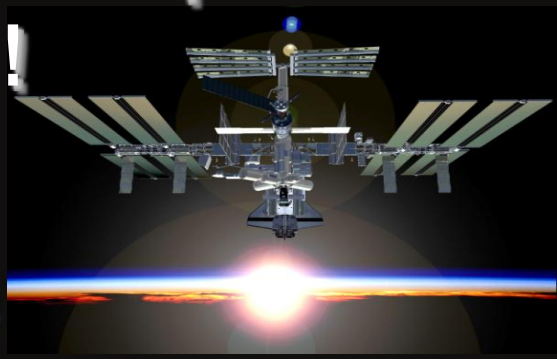
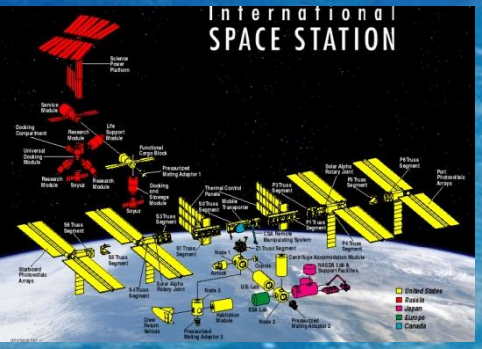
Evolution of the ISS and Its Partnership

Anticipate the Unexpected !





- US Initiative-January 1984 (State of Union Address)
- A Cold War demonstration of U.S. leadership and alliances
- From Cold War instrument into post-Cold War cooperation
- All partners now providing "critical elements" instead of "enhancements"



- Specific contributions – some duplication
- Shared Operations
- Long Term Science
- "Single" Destination in Space

Canada

Structure of the ISS Partnership

IGA Art. 1: "…, under the lead role of the United States for overall management and coordination …"

Intergovernmental Agreement:
- Legal Regime
- Top-Level Political Commitments
- Multilateral (15 nations)

Memoranda of Understanding:
- Detailed Implementation
- Roles & Responsibilities
- Obligations & Rights

Implementing Arrangements

ISS Lessons Learned

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GROUP ON EARTH OBSERVATIONS

EARTH OBSERVATION SUMMIT I

Launched at the Ministerial Level:
Political Support and Commitment is Essential for any Mega Project

GROUP ON EARTH OBSERVATIONS

GEO Societal Benefit Areas

Global Exploration Strategy: The Framework for Coordination

- August 2006, 14 space agencies discussed the definition of a vision for globally coordinated space exploration.

- May 2007, release of

ISECG
International Space Exploration Coordination Group

What is the Global Exploration Strategy?

- A high-level compelling story of the value of exploration that can be used to explain this effort to policy makers and the general public

- A blueprint that will serve as a starting point for:
  - **Coordination**: coordination among participants to maximize what can be accomplished
  - **Collaboration**: discussions between participants regarding areas of potential collaboration

The strategy focuses on
destinations within the solar system
where humans may one day live and work

Applying Lessons Learned to International Exploration of Space

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Back-Up Charts

Factors Contributing to Canada's Success with NASA

And

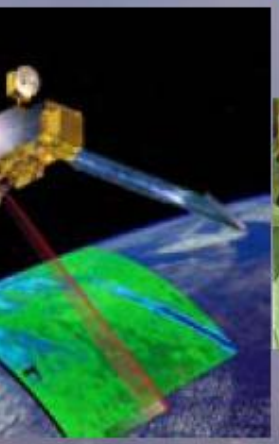
Examples of Niche Contributions

Factors Contributing to Our Success

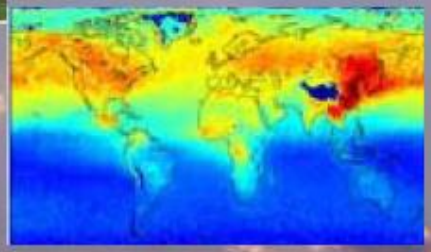
- Recognition: Canada - small space faring nation
- Ability to "identify" & "nurture" S&T niches
- Focus on areas where Canada excels
  - Develop world-class expertise
  - Unique leadership and contribution
  - Desired and valued partner
- Deliberate & focused investments
- Anticipate the future through advanced R&D
- “Space Team Canada” approach i.e. govt, industry, academia

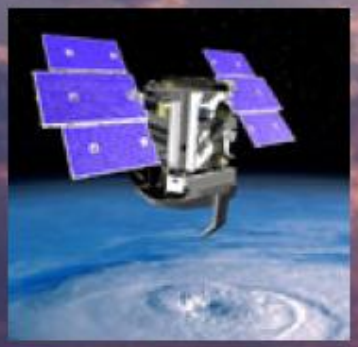
Examples of Niche Contributions

NASA Terra since 1999



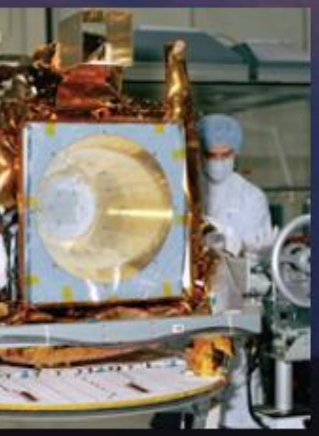
CSA: MOPITT complete instrument for measuri
carbon monoxide in the troposphere





NASA CloudSat since 2005 – Cloud structure in

CSA: key element of the cloud profiling radar
Extended Interaction Klystrons and
Radio Frequency Electronics subsystem



CSA SciSat since 2003 – NASA launch

CSA small-sat (150 kg) with spectrometer and other instruments to measure ozone in middle atmosphere

AIR, ATMOSPHERE AND CLIMATE CHANGE

Examples of Niche Contributions

RADARSAT- 1

- Launch for data arrangement with NASA and NOAA
- Nov 1995 to May 2008
- Data for National Ice Service
- Data for NASA, NOAA and USGS research
- 1999 first mapping of Antarctica

RADARSAT- 2

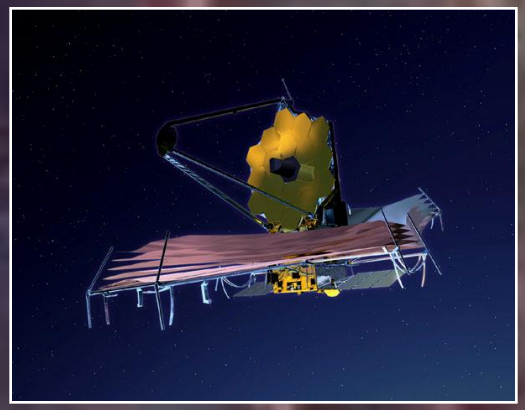
- Public-Private-Partnership
- Some data sharing between Canadian and U.S. Ice Service
- Opportunities for joint research

RADARSAT-CONSTELLATION

- Studies underway
- Preliminary discussion for cooperation with NASA, NOAA and USGS

EARTH OBSERVATION

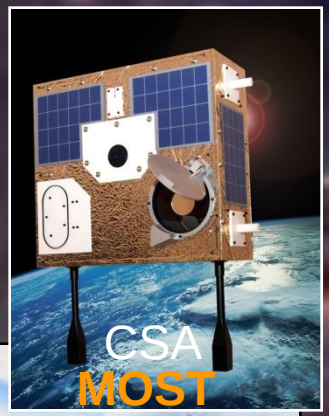
Examples of Niche Contributions

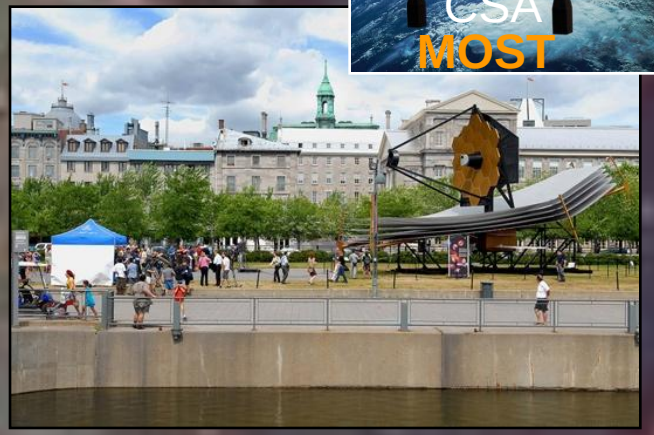


James Webb Space Telescope

U.S. with ESA and CSA instruments

CSA: Fine Guidance Sensor
(critical for pointing)
Tuneable Filter Imager



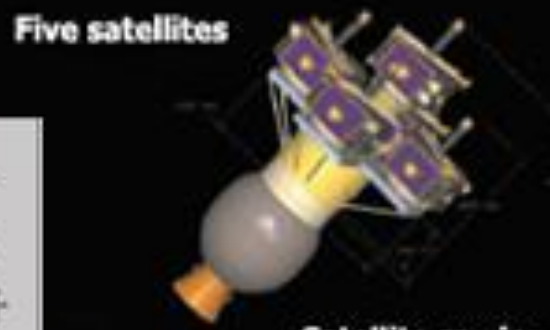


ASTRONOMY

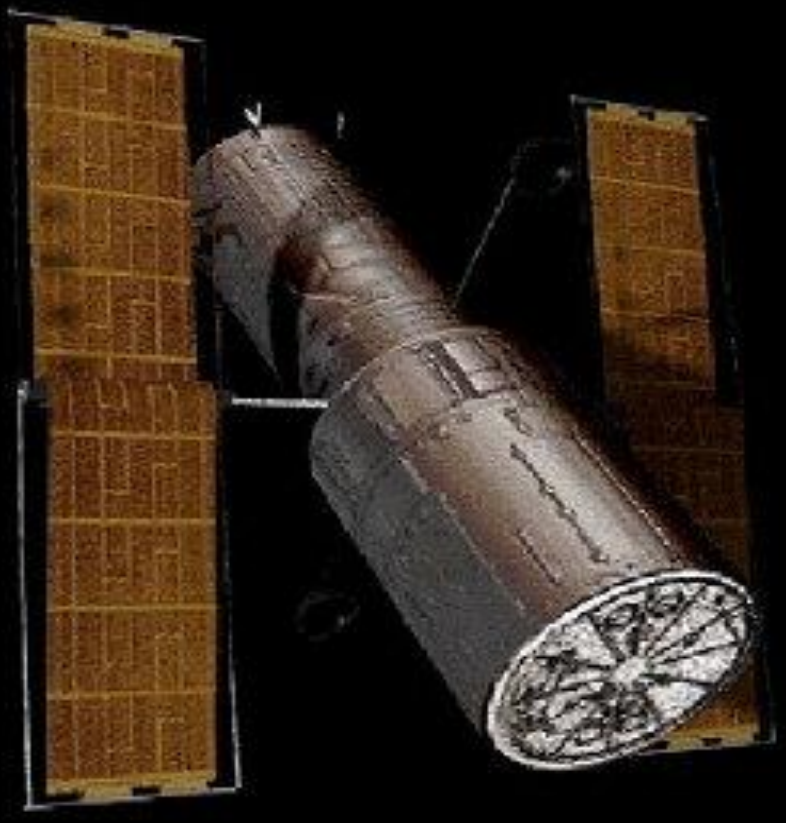
THEMIS

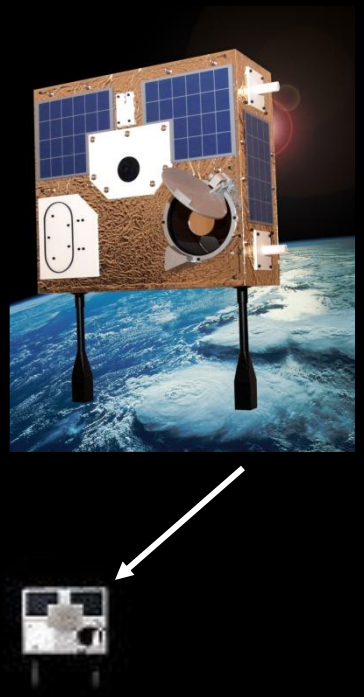
Canadian
Ground segment

HELIOPHYSICS



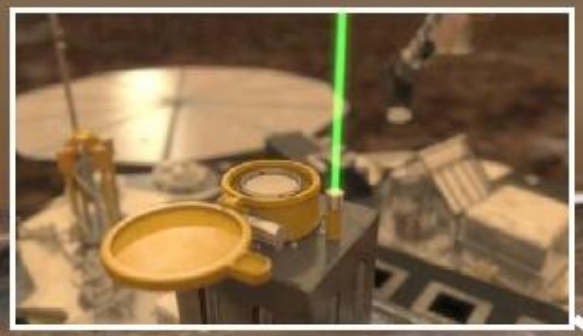
MOST
Canada's "Humble" Space Telescope!





Opportunities for U.S. Guest Principal Investigators

Examples of Niche Contributions



CSA - Lidar based Weather Station

Meteorological Station Instrumen

CSA - **Alpha Particle X-ray Spectrometer**

XPLORATION: Mars

Examples of Niche Contributions

The Early Beginnings of
Canada's Human Space Flight Program

- **1969** NASA approached Canada and Europe to join the Shuttle program
- **1969**- 1975 technical studies led to Canadarm
- **1975** Canada-US Agreement:
  - Canada to fund R&D and 1st flight unit
  - US to buy 3 flight units
  - US responsible for R&O
  - Canada granted privileged access to Shuttle
- **1981** 1st flight of Canadarm
- **1983** Canadian astronauts corps established
- **1984** 1st Canadian astronaut mission

HUMAN SPACE FLIGHT

Examples of Niche Contributions

HUMAN SPACE FLIGHT

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Examples of Niche Contributions

Integrated in the ISS Program

APCOM
SA Chief Astronaut
rew Office Rep Europe

- EVA
- Soyuz FE-1 Trained
- Head Crew Office Robotics

- CAPCOM
- Trained as Soyuz FE-

- Operational Space Medicine – NEEMO 7
- Dir JSC Life Sciences Div
- Surgical Robotics McMaster Univ – Marc

- Micro-gravity Vibration Isolation Technology
- University of Western Ontario

- Space Vision System
- CSA President since Sept

Long-Term Exploration Goals

- Participation in human Lunar exploration
  - Through surface infrastructure
  - Through precursor missions
  - Through astronaut flights

- Scientific Exploration of Mars
  - Through unmanned Mars Sample Return
  - Through precursor missions
- Supported through CSA Exploration Core Program

Criteria for Canada's Participation in Exploration

Contributions

- Early, Scalable,Transferable
- Critical, Visible and Welcomed

Decision Criteria

- Visible to the Canadian Public
- Meets Canadian science goals
- Uses Canadian enabling/heritage technologies
- Develops sustainable core competencies
- Results in Canadians flying in space
- Consistent with the Global Exploration Strategy